

each other, ~~said blades defining four fuel bundle receiving channels, said configuration~~

comprising:

<sup>NTE</sup>  
said plurality of large fuel bundles arranged in a staggered row pattern; and

said fuel bundles arranged with only four fuel bundles in each said receiving channel and two sides of each of said four fuel bundles adjacent a control rod blade.

### Remarks

The Office Action dated May 2, 2002 has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 1, 2, 4-6, 8-10, 12, and 13 are pending in this application. Claims 1, 2, 4-6, 8-10, 12, and 13 stand rejected.

Submitted herewith is a Submission Of Marked Up Claims in accordance with 37 C.F.R. § 1.121(c)(1)(ii).

Claims 1 and 10 have been amended to recite "said fuel bundles arranged with only four fuel bundles in each said receiving channel and two sides of each of said four fuel bundles adjacent a control rod blade". Support for this amendment can be found at page 8, lines 23-30 and in originally filed Figure 4.

The rejection of Claims 1, 4, 5, 10, 12, and 13 under 35 U.S.C. § 102(b) as being anticipated by Sakurai et al. (JP 04-301596) is respectfully traversed.

Claim 1 of the present application recites a core for a nuclear reactor that includes a plurality of fuel bundles and a plurality of large control rods. Each control rod includes four control rod blades extending radially from a central portion and arranged at right angles to each

other. The blades define four fuel bundle receiving channels, and the control rods are arranged in a plurality of staggered rows with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade.

Applicants submit that Sakurai et al. do not describe nor suggest a core for a nuclear reactor as recited in Claim 1. Particularly, Sakurai et al. do not describe nor suggest that the control rods are arranged in a plurality of staggered rows with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade.

As best understood, it appears that Sakurai et al. teach a large sized fuel assembly with a control rod having four control rod blades at right angles to each other. The Office Action refers to Figure 2 and suggests that the control rods are arranged in staggered rows. Applicants disagree with this suggestion and submit that Examiner cannot know what Sakurai et al. teach without a translation of the patent. Applicants submit that it appears that the control rods are arranged in even rows and that only some of the control rods are shown because it appears that there are too few control rods for the number of fuel bundles shown in Figure 2. Applicants respectfully submit that Figure 2 of Sakurai et al. does not clearly show the core arrangement recited in Claim 1. *Arguendo*, if one assumes that the Sakurai et al. control rods are in staggered rows, Sakurai et al. does not describe nor suggest four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade. Accordingly, Applicants submit that Claim 1 is patentable over Sakurai et al.

Claims 4 and 5 depend from independent Claim 1. When the recitations of dependent Claims 4 and 5 are considered in combination with the recitations of Claim 1, Applicants respectfully submit that Claims 4 and 5 likewise are patentable over Sakurai et al.

Claim 10 of the present application recites a nuclear reactor core configuration where the core includes a plurality of fuel bundles and a plurality of large control rods. Each control rod includes four control rod blades extending radially from a central portion and arranged at right angles to each other with the blades defining four fuel bundle receiving channels. The configuration comprising the plurality of large fuel bundles arranged in a staggered row pattern, and the fuel bundles arranged with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade.

Applicants submit that Sakurai et al. do not describe nor suggest a core for a nuclear reactor as recited in Claim 10. Particularly, Sakurai et al. do not describe nor suggest that the control rods are arranged in a plurality of staggered rows with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade.

As best understood, it appears that Sakurai et al. teach a large sized fuel assembly with a control rod having four control rod blades at right angles to each other. The Office Action refers to Figure 2 and suggests that the control rods are arranged in staggered rows. Applicants disagree with this suggestion and submit that Examiner cannot know what Sakurai et al. teach without a translation of the patent. Applicants submit that it appears that the control rods are arranged in even rows and that only some of the control rods are shown because it appears that there are too few control rods for the number of fuel bundles shown in Figure 2. Applicants respectfully submit that Figure 2 of Sakurai et al. does not clearly show the core arrangement recited in Claim 1. *Arguendo*, if one assumes that the Sakurai et al. control rods are in staggered rows, Sakurai et al. does not describe nor suggest four fuel bundles in each receiving channel and

two sides of each of the four fuel bundles adjacent a control rod blade. Accordingly, Applicants submit that Claim 10 is patentable over Sakurai et al.

Claims 12-13 depend from independent Claim 10. When the recitations of dependent Claims 12-13 are considered in combination with the recitations of Claim 10, Applicants respectfully submit that Claims 12-13 likewise are patentable over Sakurai et al.

For the reasons set forth above, Applicants respectfully request that the Section 102(b) rejection of Claims 1, 4, 5, 10, 12, and 13 be withdrawn.

The rejection of Claims 1, 4-6, 8-10, 12, and 13 under 35 U.S.C. § 102(b) as being anticipated by Hiraiwa (JP 06-138275) is respectfully traversed.

Applicants submit that Hiraiwa does not describe nor suggest a core for a nuclear reactor as recited in Claim 1. Particularly, Hiraiwa does not describe nor suggest that the control rods are arranged in a plurality of staggered rows with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade.

As best understood, it appears that Hiraiwa teaches control rods having four control rod blades extending from a central portion with a single fuel bundle in each receiving channel. The Office Action refers to Figures 4-6 and suggests that four fuel bundles are present in each receiving channel. Applicants disagree with this suggestion and submit that Examiner cannot know what Hiraiwa teaches without a translation of the patent. Applicants submit that Hirawa clearly shows in Figure 4 a single fuel bundle 30A in the receiving channel defined by the control rod blades, and also shows four mini-bundles 41 that form the single fuel bundle 30A. Applicants submit that Figure 4 clearly shows an outer fuel bundle housing 40 defining a single

fuel bundle 30A and surrounding the mini-bundles 41. Accordingly, Applicants submit that Claim 1 is patentable over Hiraiwa.

Claims 4 and 5 depend from independent Claim 1. When the recitations of dependent Claims 4 and 5 are considered in combination with the recitations of Claim 1, Applicants respectfully submit that Claims 4 and 5 likewise are patentable over Hiraiwa.

Claim 6 of the present application recites a core for a nuclear reactor that includes a plurality of fuel cells. Each fuel cell including a large control rod comprising four control rod blades extending radially from a central portion and arranged at right angles to each other. The blades defining four quadrants of the fuel cell, each quadrant consisting of only four fuel bundles. The plurality of fuel cells are arranged so that the control rods are in a staggered row pattern where each side of each quadrant of a fuel cell is adjacent to a control rod blade.

Applicants submit that Hiraiwa does not describe nor suggest a core for a nuclear reactor as recited in Claim 6. Particularly, Hiraiwa does not describe nor suggest a fuel cell that includes a large control rod comprising four control rod blades extending radially from a central portion and arranged at right angles to each other with the blades defining four quadrants of the fuel cell, and each quadrant consisting of only four fuel bundles.

As best understood and as explained above, it appears that Hiraiwa teaches control rods having four control rod blades extending from a central portion with a single fuel bundle in each receiving channel. The Office Action refers to Figures 4-6 and suggests that four fuel bundles are present in each receiving channel. Applicants disagree with this suggestion and submit that Examiner cannot know what Hiraiwa teaches without a translation of the patent. Applicants submit that Hirawa clearly shows in Figure 4 a single fuel bundle 30A in the receiving channel

defined by the control rod blades, and also shows four mini-bundles 41 that form the single fuel bundle 30A. Applicants submit that Figure 4 clearly shows an outer fuel bundle housing 40 defining a single fuel bundle 30A and surrounding the mini-bundles 41. Accordingly, Applicants submit that Claim 6 is patentable over Hiraiwa.

Claims 8-9 depend from independent Claim 6. When the recitations of dependent Claims 8-9 are considered in combination with the recitations of Claim 6, Applicants respectfully submit that Claims 8-9 likewise are patentable over Hiraiwa.

Applicants submit that Hiraiwa does not describe nor suggest a core for a nuclear reactor as recited in Claim 10. Particularly, Hiraiwa does not describe nor suggest that the control rods are arranged in a plurality of staggered rows with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade.

As best understood and as explained above, it appears that Hiraiwa teaches control rods having four control rod blades extending from a central portion with a single fuel bundle in each receiving channel. The Office Action refers to Figures 4-6 and suggests that four fuel bundles are present in each receiving channel. Applicants disagree with this suggestion and submit that Examiner cannot know what Hiraiwa teaches without a translation of the patent. Applicants submit that Hirawa clearly shows in Figure 4 a single fuel bundle 30A in the receiving channel defined by the control rod blades, and also shows four mini-bundles 41 that form the single fuel bundle 30A. Applicants submit that Figure 4 clearly shows an outer fuel bundle housing 40 defining a single fuel bundle 30A and surrounding the mini-bundles 41. Accordingly, Applicants submit that Claim 10 is patentable over Hiraiwa.

Claims 12-13 depend from independent Claim 10. When the recitations of dependent Claims 12-13 are considered in combination with the recitations of Claim 10, Applicants respectfully submit that Claims 12-13 likewise are patentable over Hiraiwa.

For the reasons set forth above, Applicants respectfully request that the Section 102(b) rejection of Claims 1, 4-6, 8-10, 12, and 13 be withdrawn.

The rejection of Claims 1, 4-6, 8-10, 12, and 13 under 35 U.S.C. § 102(b) as being anticipated by Kusuno. (JP 04-296693) is respectfully traversed.

Applicants submit that Kusuno does not describe nor suggest a core for a nuclear reactor as recited in Claim 1. Particularly, Kusuno does not describe nor suggest that the control rods are arranged in a plurality of staggered rows with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade.

As best understood, it appears that Kusuno teaches control rods having four control rod blades extending from a central portion with a single fuel bundle in each receiving channel. The Office Action refers to Figures 1, 13, and 22 and suggests that four fuel bundles are present in each receiving channel. Applicants disagree with this suggestion and submit that Examiner cannot know what Kusuno teaches without a translation of the patent. Applicants submit that Kusuno clearly shows in Figure 13 a single fuel bundle 1 in the receiving channel defined by the control rod blades (shown in Figure 1), and also shows four mini-bundles 5 that form the single fuel bundle 1. Applicants submit that Figure 13 clearly shows an outer fuel bundle housing 4 defining a single fuel bundle 1 and surrounding the mini-bundles 5. Accordingly, Applicants submit that Claim 1 is patentable over Kusuno.

Claims 4 and 5 depend from independent Claim 1. When the recitations of dependent Claims 4 and 5 are considered in combination with the recitations of Claim 1, Applicants respectfully submit that Claims 4 and 5 likewise are patentable over Kusuno.

Kusuno does not describe nor suggest a core for a nuclear reactor as recited in Claim 6. Particularly, Kusuno does not describe nor suggest a fuel cell that includes a large control rod comprising four control rod blades extending radially from a central portion and arranged at right angles to each other with the blades defining four quadrants of the fuel cell, and each quadrant consisting of only four fuel bundles.

As best understood, it appears that Kusuno teaches control rods having four control rod blades extending from a central portion with a single fuel bundle in each receiving channel. The Office Action refers to Figures 1, 13, and 22 and suggests that four fuel bundles are present in each receiving channel. Applicants disagree with this suggestion and submit that Examiner cannot know what Kusuno teaches without a translation of the patent. Applicants submit that Kusuno clearly shows in Figure 13 a single fuel bundle 1 in the receiving channel defined by the control rod blades (shown in Figure 1), and also shows four mini-bundles 5 that form the single fuel bundle 1. Applicants submit that Figure 13 clearly shows an outer fuel bundle housing 4 defining a single fuel bundle 1 and surrounding the mini-bundles 5. Accordingly, Applicants submit that Claim 6 is patentable over Kusuno.

Claims 8-9 depend from independent Claim 6. When the recitations of dependent Claims 8-9 are considered in combination with the recitations of Claim 6, Applicants respectfully submit that Claims 8-9 likewise are patentable over Kusuno.



Applicants submit that Kusuno does not describe nor suggest a core for a nuclear reactor as recited in Claim 10. Particularly, Kusuno does not describe nor suggest that the control rods are arranged in a plurality of staggered rows with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade.

As best understood, it appears that Kusuno teaches control rods having four control rod blades extending from a central portion with a single fuel bundle in each receiving channel. The Office Action refers to Figures 1, 13, and 22 and suggests that four fuel bundles are present in each receiving channel. Applicants disagree with this suggestion and submit that Examiner cannot know what Kusuno teaches without a translation of the patent. Applicants submit that Kusuno clearly shows in Figure 13 a single fuel bundle 1 in the receiving channel defined by the control rod blades (shown in Figure 1), and also shows four mini-bundles 5 that form the single fuel bundle 1. Applicants submit that Figure 13 clearly shows an outer fuel bundle housing 4 defining a single fuel bundle 1 and surrounding the mini-bundles 5. Accordingly, Applicants submit that Claim 10 is patentable over Kusuno.

Claims 12-13 depend from independent Claim 10. When the recitations of dependent Claims 12-13 are considered in combination with the recitations of Claim 10, Applicants respectfully submit that Claims 12-13 likewise are patentable over Kusuno.

For the reasons set forth above, Applicants respectfully request that the Section 102(b) rejection of Claims 1, 4-6, 8-10, 12, and 13 be withdrawn.

The rejection of Claims 1, 4-6, 8-10, 12, and 13 under 35 U.S.C. § 103(a) as being unpatentable over Sakurai et al. (JP 04-301596) in view of Figures 1-3 is respectfully traversed.

Applicants submit that Sakurai et al. do not describe nor suggest a core for a nuclear reactor as recited in Claim 6. Particularly, Sakurai et al. do not describe nor suggest a core where the plurality of fuel cells are arranged so that the control rods are in a staggered row pattern where each side of each quadrant of a fuel cell is adjacent to a control rod blade. As explained above, Applicants submit that it appears that the control rods shown in Figure 2 of Sakurai et al. are arranged in even rows and that only some of the control rods are shown because it appears that there are too few control rods for the number of fuel bundles shown in Figure 2. *Arguendo*, if one assumes that the Sakurai et al. control rods are in staggered rows, Sakurai et al. does not describe nor suggest that each quadrant of a fuel cell is adjacent a control rod blade. Accordingly, Applicants submit that independent Claim 6 is patentable over Sakurai et al. As explained above, independent Claims 1 and 10 are patentable over Sakurai et al.

Applicants submit that Figures 1-3 do not show or suggest a core for a nuclear reactor as recited in Claim 1, a core for a nuclear reactor as recited in Claim 6, or a nuclear reactor as recited in Claim 10. Particularly, Figures 1-3 do not show or suggest a core with the control rods having four fuel bundle receiving channels with four fuel bundles in each receiving channel. Rather, Figure 2 shows a conventional configuration of control rods and fuel bundles of a reactor core. The control rods include four control rod blades arranged at right angles to each other which define four fuel bundle receiving channels around the control rod. Each receiving channel is sized to receive one fuel bundle. Also, Figure 3 shows a L-lattice configuration with large control rods in staggered rows. Each large control rod includes four blades arranged at right angles to each other which define four fuel bundle receiving channels around the control rod.

Each receiving channel includes one large fuel bundle. As explained in a previous amendment filed February 26, 2002, Figure 1 is not prior art.

Applicants submit that Sakurai et al. in combination with Figures 1-3 do not show or suggest a core for a nuclear reactor as recited in Claim 1, a core for a nuclear reactor as recited in Claim 6, or a nuclear reactor as recited in Claim 10 because neither Sakurai et al. nor Figures 1-3 describe or suggest a core with the control rods arranged in a plurality of staggered rows with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade. Accordingly, Claims 1, 6, and 10 are submitted to be patentable over Sakurai et al. in combination with Figures 1-3.

Claims 4 and 5 depend from independent Claim 1, Claims 8-9 depend from independent Claim 6, and Claims 12-13 depend from independent Claim 10. When the recitations of dependent Claims 4 and 5, and Claims 8-9, and Claims 12-13 are considered in combination with the recitations of Claims 1, 6, and 10 respectively, Applicants respectfully submit that Claims 4, 5, 8-9, and 12-13 likewise are patentable over Sakurai et al. and Figures 1-3 of the present application, alone or in combination.

For the reasons set forth above, Applicants respectfully request that the Section 103(a) rejection of Claims 1, 4-6, 8-10, 12, and 13 be withdrawn.

The rejection of Claims 1, 4-6, 8-10, 12, and 13 under 35 U.S.C. § 103(a) as being unpatentable over either Hiraiwa or Kusuno in view of Figures 1-3 is respectfully traversed.

As explained above independent Claims 1, 6, and 10 are patentable over Hiraiwa and Kusuno.

Applicants submit that Hiraiwa or Kusuno in combination with Figures 1-3 do not show or suggest a core for a nuclear reactor as recited in Claim 1, a core for a nuclear reactor as recited in Claim 6, or a nuclear reactor as recited in Claim 10 because neither Hiraiwa, Kusuno, nor Figures 1-3 describe or suggest a core with the control rods arranged in a plurality of staggered rows with only four fuel bundles in each receiving channel and two sides of each of the four fuel bundles adjacent a control rod blade. Accordingly, Claims 1, 6, and 10 are submitted to be patentable over Hiraiwa or Kusuno in combination with Figures 1-3.

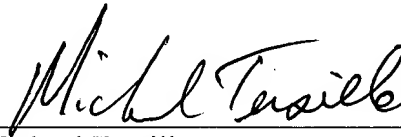
Claims 4 and 5 depend from independent Claim 1, Claims 8-9 depend from independent Claim 6, and Claims 12-13 depend from independent Claim 10. When the recitations of dependent Claims 4 and 5, and Claims 8-9, and Claims 12-13 are considered in combination with the recitations of Claims 1, 6, and 10 respectively, Applicants respectfully submit that Claims 4, 5, 8-9, and 12-13 likewise are patentable over Hiraiwa, Kusuno and Figures 1-3 of the present application, alone or in combination.

For the reasons set forth above, Applicants respectfully request that the Section 103(a) rejection of Claims 1, 4-6, 8-10, 12, and 13 be withdrawn.

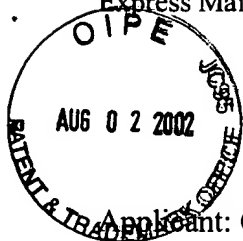
Applicants note that Claim 2 has not been rejected over any of the cited art. Applicants submit that for the reasons set forth above, independent Claim 1 is patentable over the cited art. Claim 2 depends from Claim 1. When the recitations of Claim 2 is considered in combination with the recitations of Claim 1, Applicants respectfully submit that Claim 2 likewise is patentable over the cited art.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Favorable action is respectfully solicited.

Respectfully submitted,

A handwritten signature in cursive script, reading "Michael Tersillo", written in black ink. The signature is positioned above a horizontal line.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Challberg et al.

Serial No.: 09/597,113

Filed: June 20, 2000

For: CORE CONFIGURATION FOR A  
NUCLEAR REACTOR

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: Art Unit: 3641  
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: Examiner: J. Keith  
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:  
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**SUBMISSION OF MARKED UP CLAIMS**

Hon. Commissioner for Patents  
Washington, D.C. 20231

A marked-up version of amended Claims 1 and 10, in accordance with 37 C.F.R.  
§ 1.121(c)(1)(ii), follows below.

MARKED UP CLAIMS

1. (twice amended) A core for a nuclear reactor comprising:  
  
a plurality of fuel bundles; and  
  
a plurality of large control rods, each said control rod comprising four control rod blades  
extending radially from a central portion and arranged at right angles to each other, said blades  
defining four fuel bundle receiving channels, said control rods arranged in a plurality of  
staggered rows with only four fuel bundles in each said receiving channel and two sides of each  
of said four fuel bundles adjacent a control rod blade.

10. (twice amended) A nuclear reactor core configuration, said core comprising a  
plurality of fuel bundles and a plurality of large control rods, each said control rod comprising  
four control rod blades extending radially from a central portion and arranged at right angles to

each other, said blades defining four fuel bundle receiving channels, said configuration comprising:

said plurality of large fuel bundles arranged in a staggered row pattern; and

said fuel bundles arranged with only four fuel bundles in each said receiving channel and two sides of each of said four fuel bundles adjacent a control rod blade.

Respectfully submitted,



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